

STUDIES IN THE GUTTIFERAE.
III. AN EVALUATION OF SOME PUTATIVE
SPONTANEOUS GARDEN HYBRIDS IN
HYPERICUM SECT. MYRIANDRA¹

PRESTON ADAMS

For many years several species of *Hypericum* have been in cultivation at the Arnold Arboretum, Jamaica Plain, Massachusetts. Some of these are woody shrubs of Sect. *Myriandra* native to eastern North America. Around 1909 Alfred Rehder, a long-time member of the staff, discovered in the Arboretum garden plants of *Hypericum* which appeared to him to be intermediate in many characteristics between some of these native American species. He thought that these "atypical" individuals were spontaneous hybrids and, being interested in new and different plants for horticultural purposes, gave them binomials. The specimens which he collected are now in the herbarium of the Arnold Arboretum.

During monographic studies of the woody specimens of *Hypericum* in eastern North America (Adams, 1962), I examined Rehder's specimens. Having observed little evidence of hybridization among these plants in nature, I welcomed the opportunity to study putative examples of spontaneous crossing under garden conditions. The present contribution is an evaluation of the possible hybrid nature of Rehder's specimens.

Hypericum × *Arnoldianum* Rehder, *Mitteil. Deutsch. Dendrol. Ges.* 19: 253. 1910 [1911?]. Rehder applied this name to plants which he believed had originated from a cross between *H. lobocarpum* Gattinger and *H. galioides* Lam., with the latter being the maternal parent. During 1910 Rehder made several collections of this putative

¹Financial support for this study was provided by the Graduate Council Research Fund of DePauw University and the Fernald Fund for Field Study in Systematic Botany at Harvard University, established by the late Mr. F. W. Hunnewell of Wellesley, Mass. I want to thank Dr. Tod F. Stuessy of Ohio State University for helpful comments on the manuscript.

hybrid. These plants persisted in the Arboretum for many years, there being collections made in 1916, 1921, and 1927 in the herbarium of the Arboretum.

Study of Rehder's specimens of *H. × Arnoldianum* lend support to his hypothesis of a hybrid origin for these plants. The most convincing evidence is the presence of a very poor seed set in the mature fruits on a collection made by Rehder on October 9, 1910. In each capsule examined nearly all of the ovules had aborted early in their development and only a few well-formed seeds were present in each fruit.

The exact parental origin of *H. × Arnoldianum* is problematical. Some substantiation for Rehder's belief that *H. lobocarpum* may have served as one of the parents of this species is provided by analysis of the style numbers. The 5-styled condition is characteristic of the majority of fruits of *H. lobocarpum*: some 79% of 2014 capsules from 23 collections of wild plants had 5 styles (Adams, 1962). While the 5-styled condition was found in only 3% of the 63 capsules of *H. × Arnoldianum* examined, about 16% had 4 styles. The 4-styled condition was present in about 19% of the fruits of *H. lobocarpum* examined. In addition, the deeply lobed condition so characteristic of the capsules of *H. lobocarpum* is approached by the partially lobed fruits of *H. Arnoldianum*. It seems reasonable, therefore, to consider *H. lobocarpum* to have participated in the ancestry of *H. × Arnoldianum*.

The identity of the maternal parent of *H. × Arnoldianum* is less clear. Study of Rehder's specimens of this species does afford support for his hypothesis that *H. galioides* was involved. Evidence against this hypothesis is provided by analysis of style numbers. Of a total of 63 mature fruits of *H. × Arnoldianum* examined, 16% possessed 4 styles, 3% had 5 styles, and the remaining 81% were 3-styled. Capsules of the putative maternal parent, *H. galioides*, are almost invariably 3-styled, with 4-styled fruits being seen very rarely.

What might have been the maternal parent of *H. × Arnoldianum*? A clue may be provided by the striking

resemblance between specimens of this species and plants of *H. densiflorum* Pursh, especially those obtained from populations of the latter species growing in eastern Tennessee. In both plants the leaves are 10-15 times longer than wide. In addition, the seed size and coat ornamentation of *H. × Arnoldianum* compare very well with that present in *H. densiflorum*. Plants of *H. densiflorum* were in cultivation at the time that Rehder described *H. × Arnoldianum* and these could well have served as one of the parents of this species. The close resemblance of *H. × Arnoldianum* to plants from the eastern Tennessee populations of *H. densiflorum* could be explained by postulating that some of the Arboretum's living collections of the latter species might have been originally obtained from the Tennessee portion of the geographic range of *H. densiflorum*. The available evidence, therefore, suggests that the spontaneous cross that is hypothesized to have produced *H. × Arnoldianum* most likely occurred between plants of *H. densiflorum* and *H. lobocarpum*. Rehder's suggestion that *H. galioides* may have been involved may have been due to misidentification of specimens. Such an error is understandable, since several collectors of *Hypericum* in eastern Tennessee, especially during the late 19th and early 20th centuries, identified specimens of *H. densiflorum* as *H. galioides*. However, both Svenson (1940) and Adams (1962) have shown that the latter species is a native of the lower Atlantic and Gulf Coastal plains.

Further support for the hypothesis that *H. lobocarpum* and *H. densiflorum* may have been the parents of *H. × Arnoldianum* is provided by chromosome analysis. In plants from the Arnold Arboretum identified as *H. × Arnoldianum* (perhaps the same individuals studied by Rehder), Hoar and Haertl (1932) found a gametic number of 9. They reported "no irregularity in chromosome behavior nor morphological sterility of pollen" and concluded that this hybrid "apparently came from compatible parents." Since they did not preserve voucher specimens, their identification cannot now be verified. *If* they did indeed

study the chromosomes of true *H. × Arnoldianum*, then the observed chromosome regularity and viable pollen would constitute strong support for the hypothesis that the putative parents were indeed *H. lobocarpum* and *H. densiflorum*. These two species are very closely related. In fact, *H. lobocarpum*, a plant of Arkansas and adjacent portions of surrounding states, has been considered as a variety of *H. densiflorum* (Svenson, 1940), but the geographic ranges of each of these species are not known to overlap, there being at least 80 miles distance between the nearest known populations (Adams, 1962).

Hypericum × Dawsonianum Rehder *l. c.* The plants of this putative hybrid were hypothesized by Rehder to have originated from a spontaneous cross between *H. lobocarpum* Gattinger and *H. prolificum* L., with the latter as the maternal parent. Two collections, both in mature fruit, were made by Rehder in the Arboretum gardens during the fall of 1910.

That Rehder's plants of *H. × Dawsonianum* are most likely indeed of hybrid origin is strongly suggested by the very poor seed set in the fruits, with most of the ovules having failed to develop to maturity. Additional support for this hypothesis is provided by an array of features and conditions more or less intermediate between the two putative parents, *H. lobocarpum* and *H. prolificum*. The seed size and coat ornamentation of the few seeds that are present in the mature fruits are distinctly intermediate between the two presumed parental species. The style number of Rehder's collection of October 9 of *H. × Dawsonianum* is also intermediate between these two species: about 50% are 3-styled and 50% are 4-styled. Almost the same ratio of 3- and 4-styled capsules is present in Rehder's collection of October 10; a very few fruits, however, had 5 styles. The 5-styled condition occurred in about 79% of 2014 capsules from 23 collections (Adams, 1962) of *H. lobocarpum*. Fruits with 3 styles are the rule in *H. prolificum*, with only an occasional capsule having 4 or, very rarely, 5 styles. In addition, the fruit size of *H. × Daw-*

sonianum is well within the range of *H. prolificum*. The sulcate to deeply lobed capsules of *H. × Dawsonianum*, however, are strikingly similar to those of *H. lobocarpum*.

Further substantiation of the hypothesis of hybridization between *H. lobocarpum* and *H. prolificum* is the observation that interbreeding may occur occasionally between plants of these two species growing in the field. I have seen 3 collections from Ripley Co., Missouri (*Steyermark* 66885, F; *Bush* 282, GH, NY; *Makensie* 395, NY) and one from Howell County (*Steyermark* 40010, F, MO) which I cannot assign definitely to either species. Several factors favor the occurrence of hybridization between these two species. The distributional range of the more southern *H. lobocarpum* overlaps that of the more northern *H. prolificum* in central Arkansas, forming a zone some 3 or 4 counties wide running from the southwestern corner of the state diagonally across to southeastern Missouri (Adams, 1962). Plants of both species flower at the same time, and there is little obvious difference in their habitat requirements. As living specimens of *H. lobocarpum* and *H. prolificum* had been cultivated in the Arnold Arboretum for many years, it seems reasonable to conclude that Rehder's *H. × Dawsonianum* specimens did indeed originate as the result of spontaneous crossing between these two species under garden conditions.

The meiotic chromosome behavior of an individual plant of *H. × Dawsonianum* was reported by Hoar and Haertl (1932) as displaying no irregularity. Neither did they observe any evidence of pollen sterility. Based on their findings, they concluded that the putative parents of the hybrid were genetically "compatible." As with the case of *H. × Arnoldianum*, however, no voucher specimens were preserved and, therefore, it is not now possible to verify the original identification.

Hypericum × nothum Rehder, *l. c.*, 254. On October 10, 1910 Rehder collected specimens in the Arboretum which he interpreted to be the product of a cross between *H. kalmianum* L. and *H. densiflorum* Pursh, with the latter as the maternal parent. There is little evidence, however,

to support his hypothesis of hybrid origin of these plants. The few 4- and 5-styled fruits present on the specimens of the putative hybrid are suggestive of *H. kalmianum*, which is typically 5-styled although 4 styles are not infrequently encountered. However, most of the fruits on Rehder's specimens have only 3 styles, a characteristic of *H. densiflorum*. Other close resemblances to *H. densiflorum* include seed shape, size and coat ornamentation, inflorescence form, and fruit shape and size. These features strongly suggest that Rehder's specimens of *H. × nothum* are most likely not of hybrid origin. They can be readily assigned to *H. densiflorum*.

Hypericum × VanFleetii Hort. ex Rehder, Man. Cult. Trees and Shrubs, ed. 2, 640. 1940. According to Rehder, this binomial refers to a horticultural form believed to be a hybrid between *H. prolificum* and *H. frondosum* Michx. There is no evidence that the several specimens of cultivated plants in the herbarium of the Arnold Arboretum bearing this name are of hybrid origin. Instead, I believe that they are readily referable to *H. prolificum*.

It is doubtful if any of these putative hybrids are still being maintained by horticulturists. There were none present in the gardens of the Arnold Arboretum in 1959. This is not surprising since there are several introduced species of *Hypericum* which make better garden plants, with larger and more showy flowers and other more desirable features. In the living collections at the Kew Gardens in England there are several woody shrubs of *Hypericum* Sect. *Myriandra* originally obtained from eastern North America. According to Dr. N. K. B. Robson of the British Museum of Natural History (personal communication), these plants "do not seem to fit exactly into any of the described species." It is entirely possible, therefore, that when two or more of the woody species are brought into the garden, some hybridization may take place. In nature, however, there appears to be very little interspecific hybridization among the woody members of *Hypericum* Sect. *Myriandra*.

LITERATURE CITED

- ADAMS, PRESTON. 1962. Studies in the Guttiferae. I. A synopsis of *Hypericum* Section *Myriandra*. Contrib. Gray Herb. 189, 1-51.
- HOAR, C. S. and E. J. HAERTL. 1932. Meiosis in the genus *Hypericum*. Bot. Gaz. 93: 197-204.
- SVENSON, H. K. 1940. Plants of the southern United States. II. Woody species of *Hypericum*. Rhodora 42: 8-19.

DEPARTMENT OF BOTANY
DEPAUW UNIVERSITY
GREENCASTLE, INDIANA 46135